

What is Claimed is:

1. Apparatus for crimping/bending a tube comprising:

- a frame including a female die,
- a toggle assembly mounted on said frame and
- 5 having male dies that, in cooperation with said female die, crimp said tube, and
- a carriage assembly having a receiving element slidably mounted on said frame, a carriage shaft carried on said receiving element and engaging said frame to move
- 10 said carriage assembly relative to said frame, a carriage handle rotably mounted on said carriage shaft and means for coupling said carriage handle to said carriage shaft, said means for coupling having a first configuration wherein said carriage handle engages and turns said
- 15 carriage shaft when turned in a first direction and rotates freely relative to said carriage shaft when turned in an opposite second direction, and a second configuration wherein said carriage handle rotates freely relative to said carriage shaft in both directions,
- 20 whereby said toggle and carriage assemblies are actuated alternately, crimping then advancing and folding said tube, to a plurality of folds in said tube, thereby bending said tube.

- 2. Apparatus as set forth in Claim 1 wherein said means for coupling includes a cam clutch, mounted on said carriage shaft, that engages and turns said carriage shaft when turned in said first direction and rotates
- 5 freely relative to said carriage shaft when turned in said second direction.

3. Apparatus as set forth in Claim 2 wherein
said means for coupling includes a plunger slidably
mounted on said carriage handle, said plunger engaging
said cam clutch in a first position and slidably moving
5 to a second position and disengaging said cam clutch in
said second position.

4. Apparatus as set forth in Claim 1 wherein
said carriage assembly includes a means for limiting the
rotation of the carriage handle.

5. Apparatus as set forth in Claim 4 wherein
said means for limiting includes a ring attached to said
carriage handle and having a stop groove, and a stop rod
carried on said receiving element and extending into said
5 stop groove, so that said stop rod limits rotation of
said carriage handle at opposite ends of said groove.

6. Apparatus as set forth in Claim 1 wherein
said frame includes a toothed rack and said carriage
shaft includes a toothed carriage pinion that engages
said rack so that when said carriage shaft rotates said
5 carriage assembly moves relative to said frame.

7. Apparatus as set forth in Claim 1 wherein:
said female die includes an annular groove,
said male dies include a top, right and left
male die,

5 said top male die overlaps said right male die
and said left male die, and

said top male die has a working tip that tapers
towards said right and left male dies and said right and
left male dies each have a working tip that tapers toward
10 said top male die,

whereby said working tips of said top, right and left male dies form a wedge that self-centers said working tips of said top, right and left male dies in said annular groove of said female die.

8. Apparatus as set forth in Claim 1 wherein said receiving element includes a plurality of tube receiving grooves sized and shaped to receive a plurality of tube sizes and orientations.

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9. Apparatus for crimping/bending a tube comprising:

a frame including a toothed rack, and a female die mounted on an end of said toothed rack and having an
5 annular groove,

a toggle assembly mounted on said frame and having top, left and right male dies that, in cooperation with said female die, crimp said tube, said top male die overlapping said right male die and said left male die,
10 said top male die having a working tip that tapers towards said right and left male dies and said right and left male dies each having a working tip that tapers toward said top male die, whereby said working tips of said top, right and left male dies form a wedge that
15 self-centers said working tips of said top, right and left male dies in said annular groove of said female die, and

a carriage assembly having a receiving element slidably mounted on said frame, a carriage shaft carried
20 on said receiving element and having a pinion that engages said rack to move said carriage assembly relative to said frame, a carriage handle rotably mounted on said

carriage shaft, a cam clutch mounted on said carriage shaft that engages and turns said carriage shaft when
25 turned in a first direction and rotates freely relative to said carriage shaft when turned in a second direction, a plunger slidably mounted on said carriage handle that engages said cam clutch in a first position and slidably moves to a second position and disengages said cam clutch
30 in said second position, a ring attached to said carriage handle and having a stop groove, and a stop rod carried on said receiving element, extending into said stop groove, and limiting rotation of said carriage handle at opposite ends of said groove, said receiving element
35 including a plurality of tube receiving grooves sized and shaped to receive a plurality of tube sizes and orientations,

whereby said toggle and carriage assemblies are actuated alternately, crimping then advancing and folding
40 said tube, to a plurality of folds in said tube, thereby bending said tube.